FIG. 1

PRIOR ART

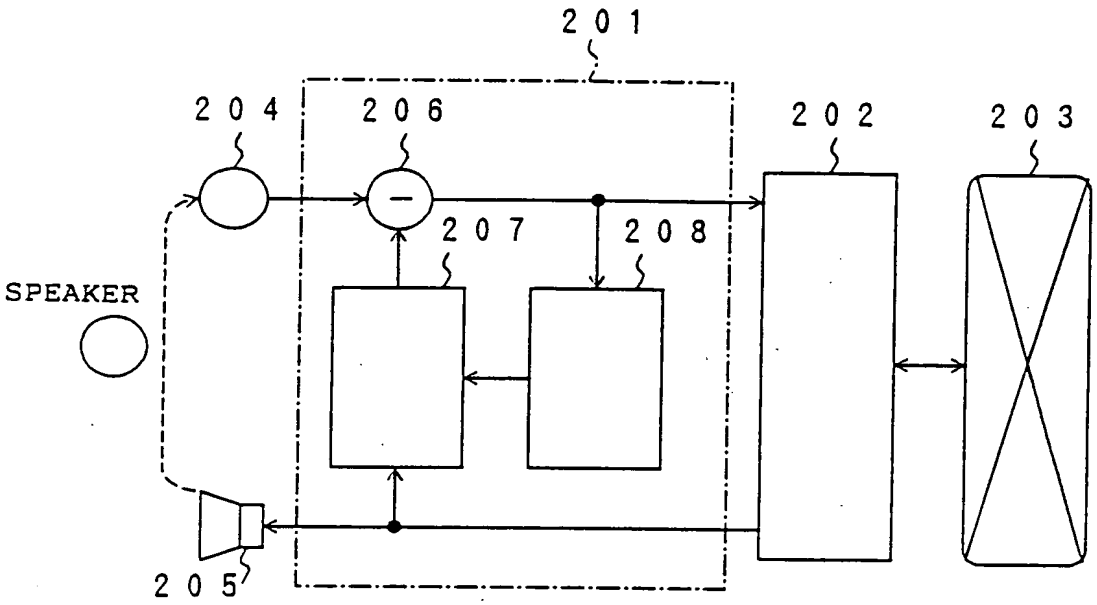

FIG. 2

PRIOR ART

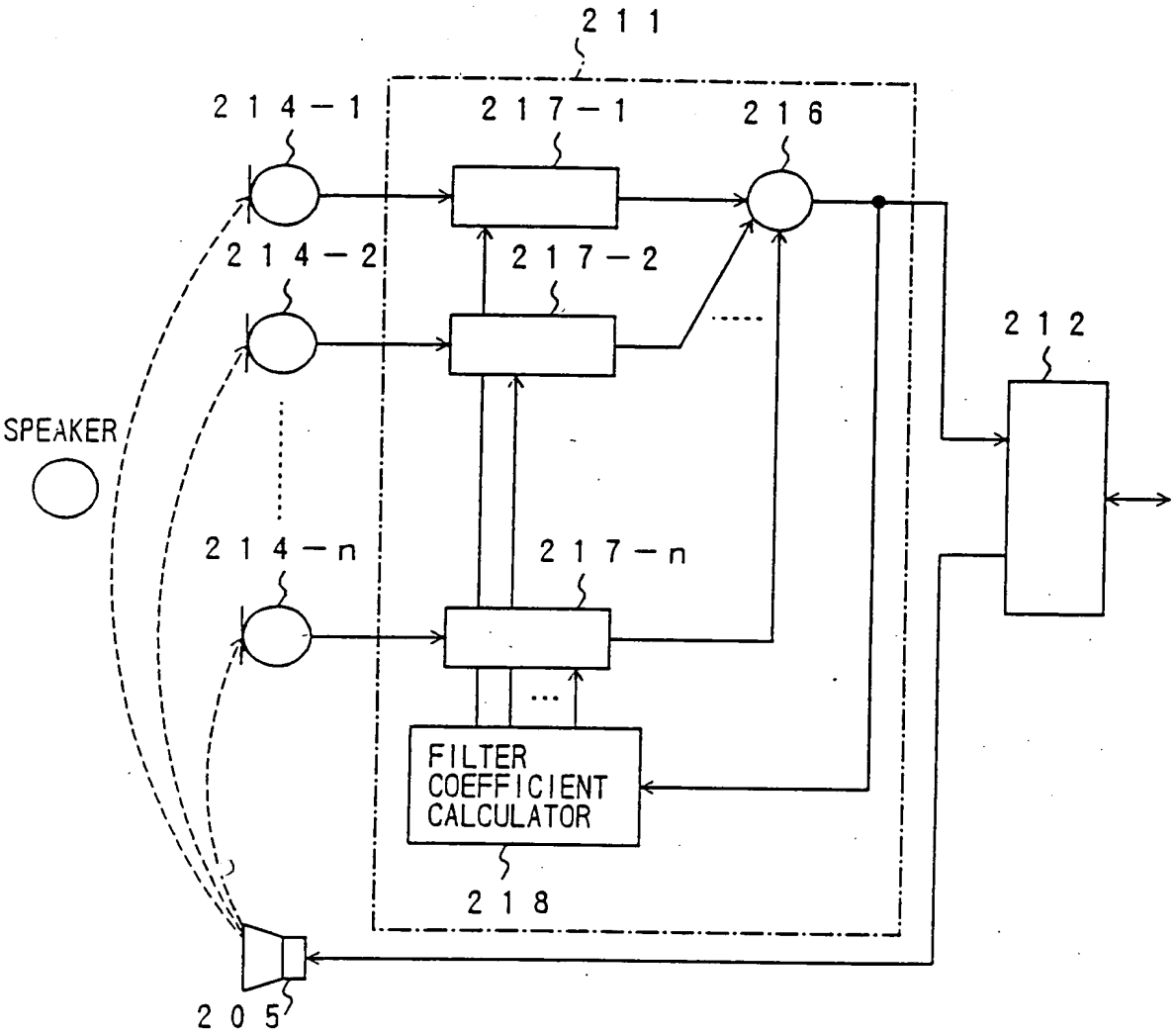

FIG. 3

PRIOR ART

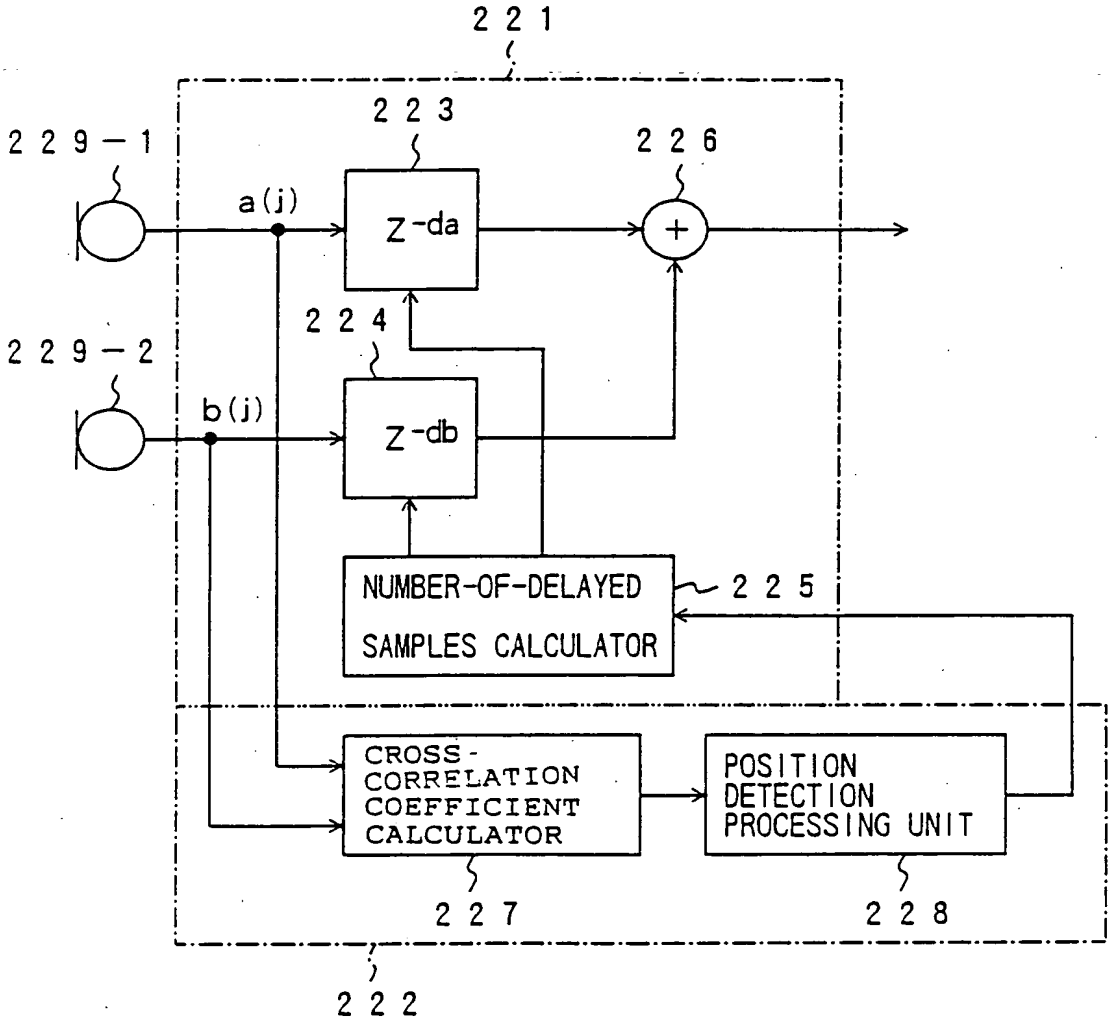

FIG. 4

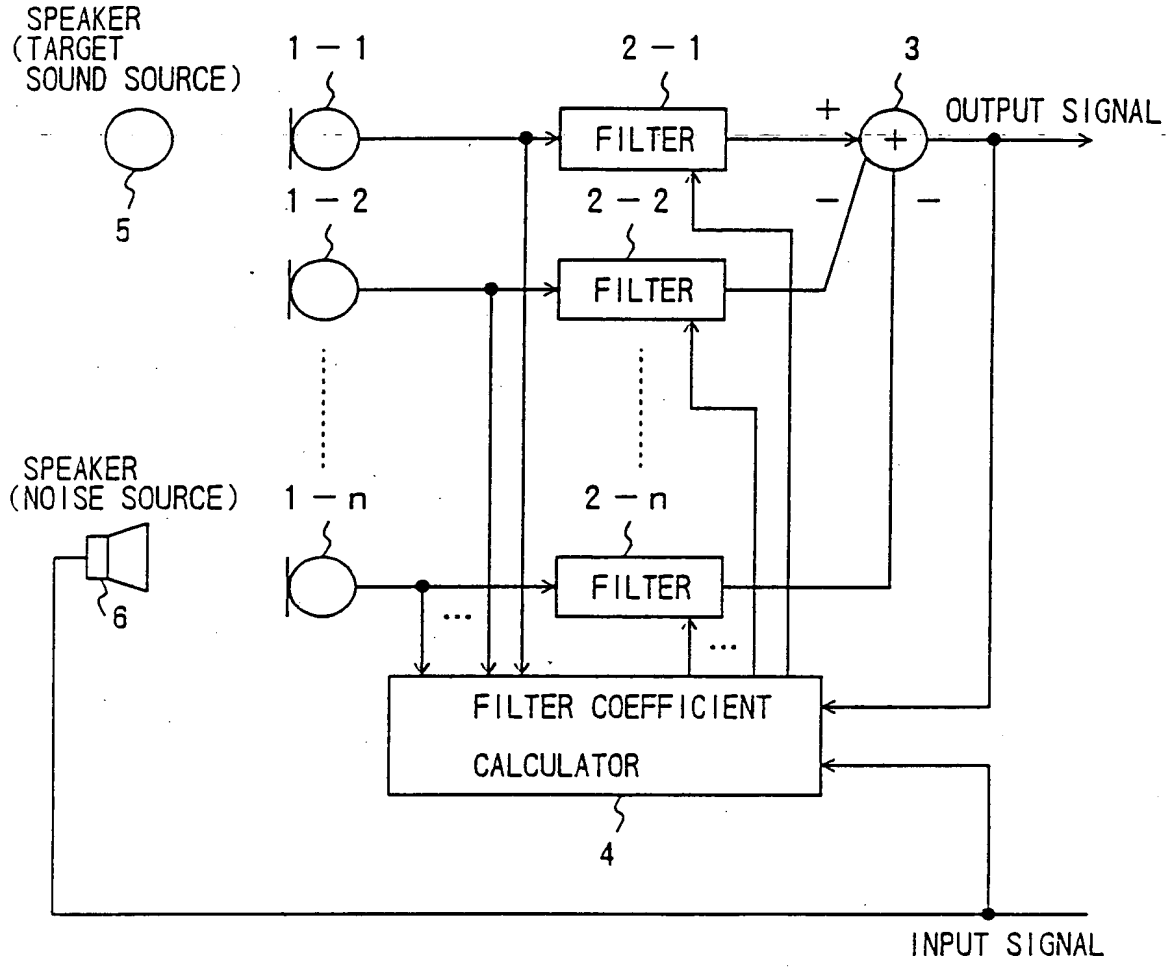
SPEAKER
(TARGET
SOUND SOURCE)
5
1 − 1
2 − 1
3
FILTER
+
+
OUTPUT SIGNAL
1 − 2
2 − 2
−
−
FILTER
SPEAKER
(NOISE SOURCE)
6
1 − n
2 − n
FILTER
...
...
FILTER COEFFICIENT
CALCULATOR
4
INPUT SIGNAL

FIG. 5

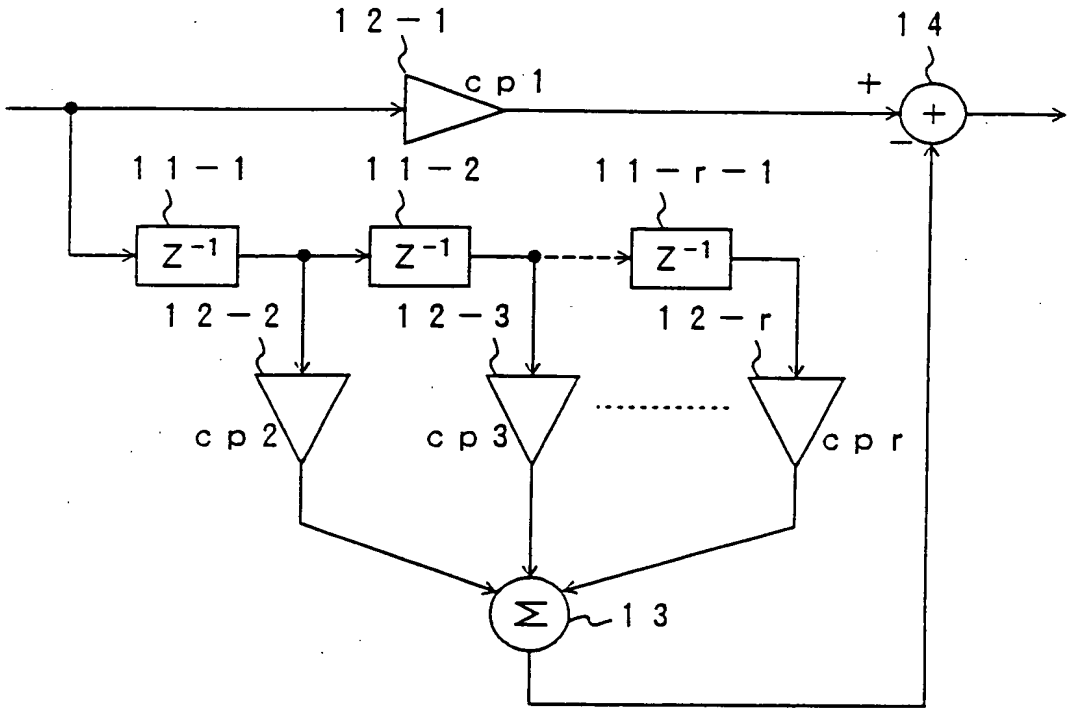

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FIG. 6

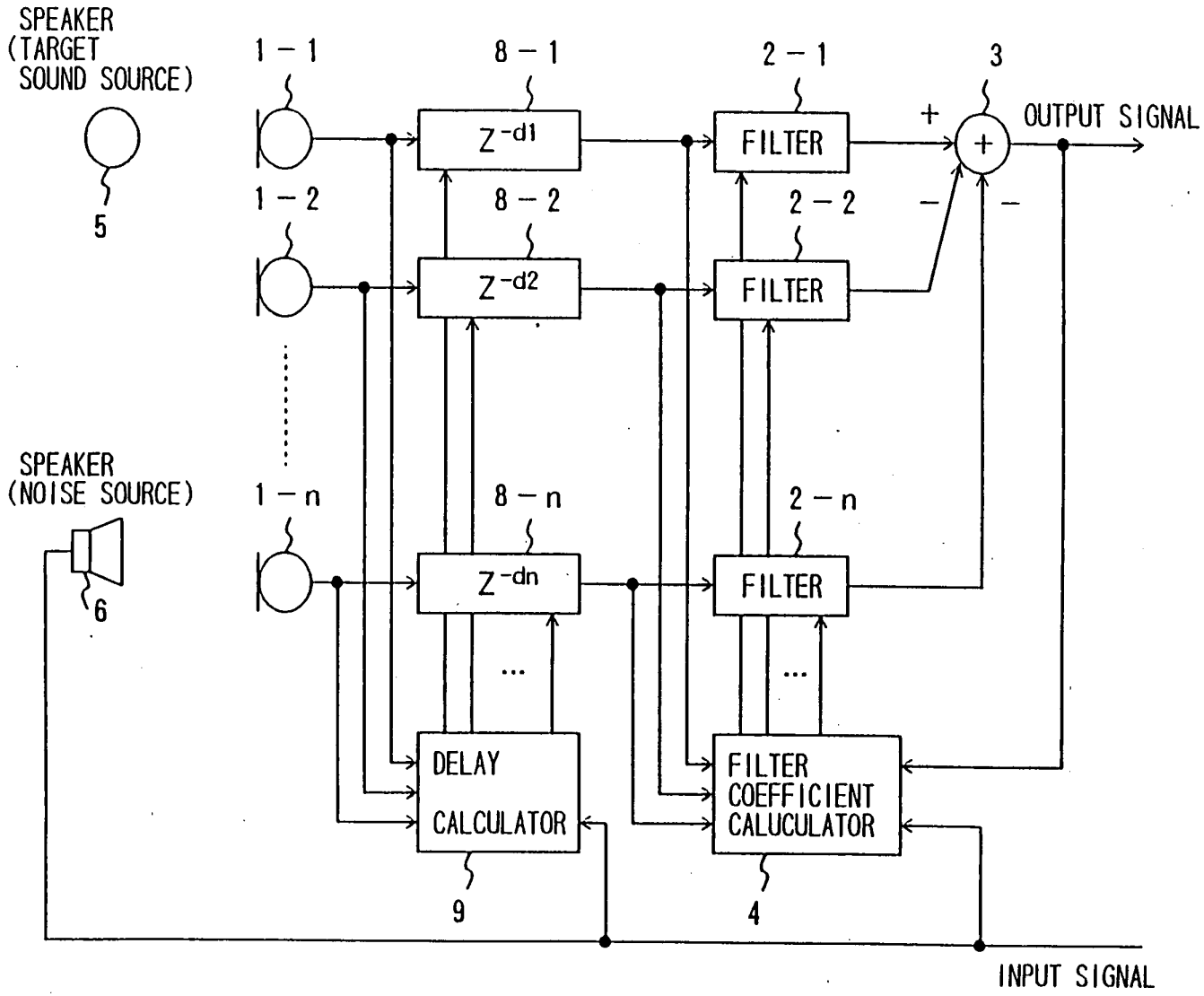


FIG. 7

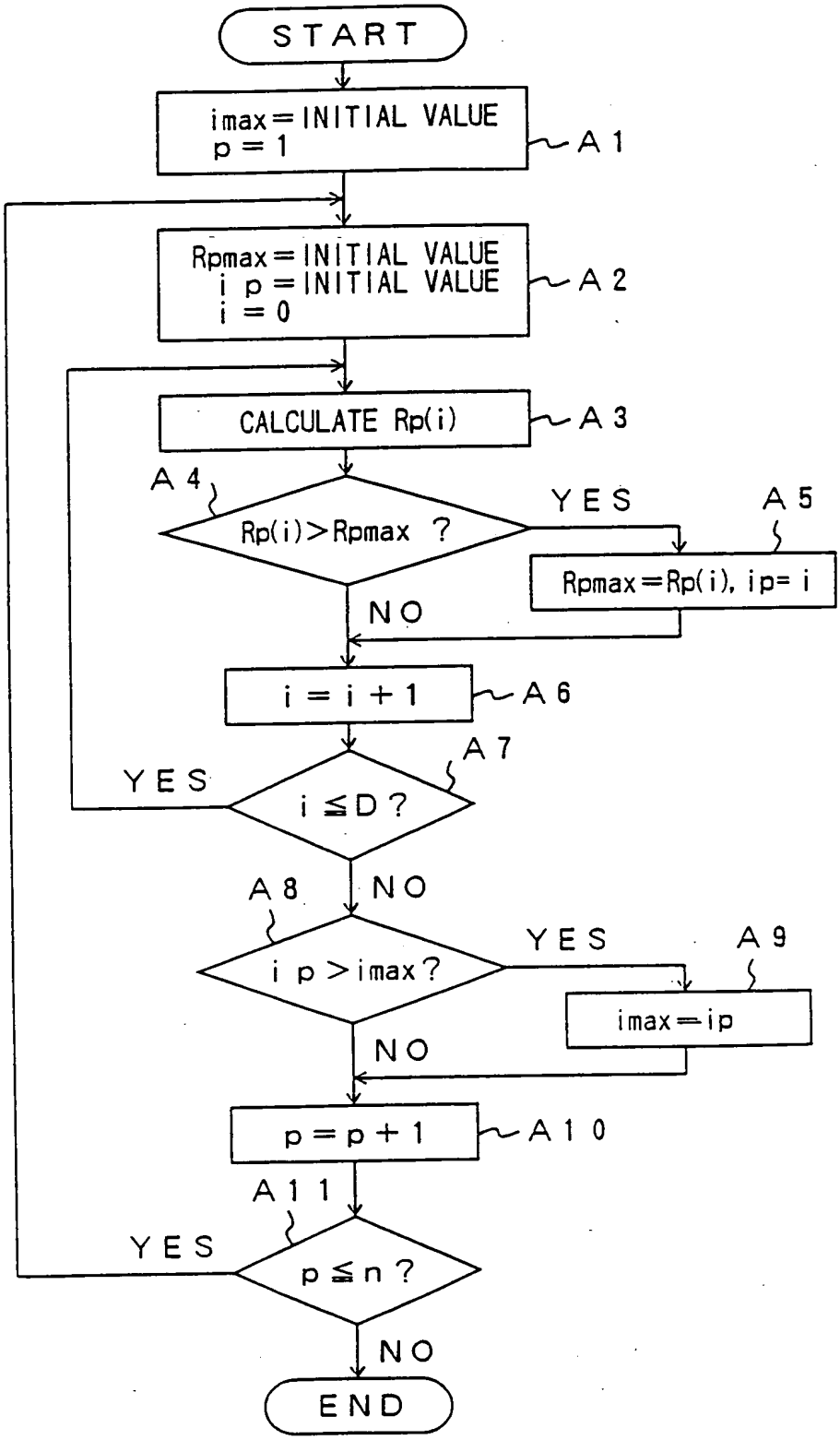

START
imax=INITIAL VALUE
p=1
A1
Rpmax=INITIAL VALUE
ip=INITIAL VALUE
i=0
A2
CALCULATE Rp(i)
A3
A4
Rp(i)>Rpmax ?
YES
A5
Rpmax=Rp(i), ip=i
NO
i=i+1
A6
A7
YES
i≦D?
A8
NO
ip>imax?
YES
A9
imax=ip
NO
p=p+1
A10
A11
YES
p≦n?
NO
END

FIG. 8

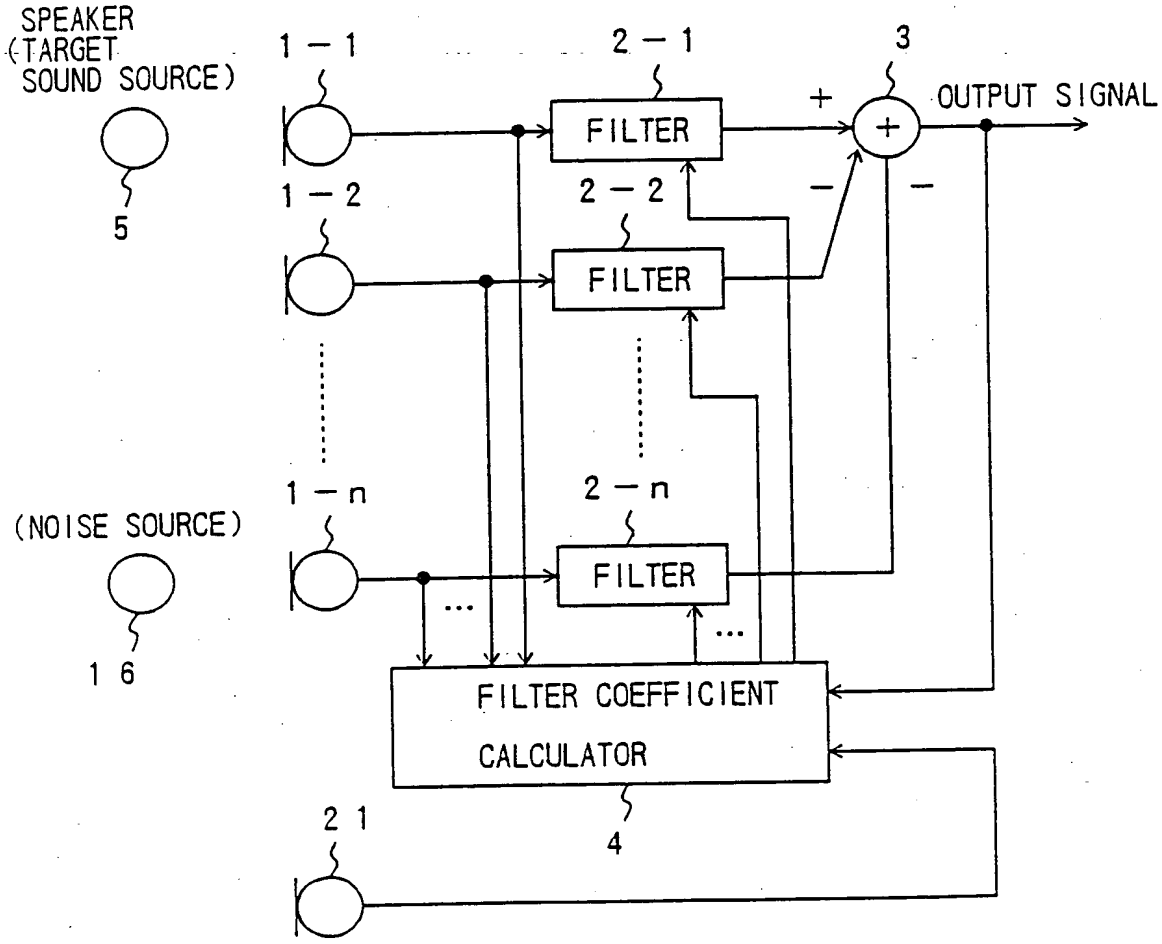

SPEAKER
(TARGET
SOUND SOURCE)
5
(NOISE SOURCE)
16
1 − 1
1 − 2
1 − n
2 − 1
2 − 2
2 − n
FILTER
FILTER
FILTER
3
+
+
−
−
OUTPUT SIGNAL
FILTER COEFFICIENT
CALCULATOR
4
21

FIG. 9

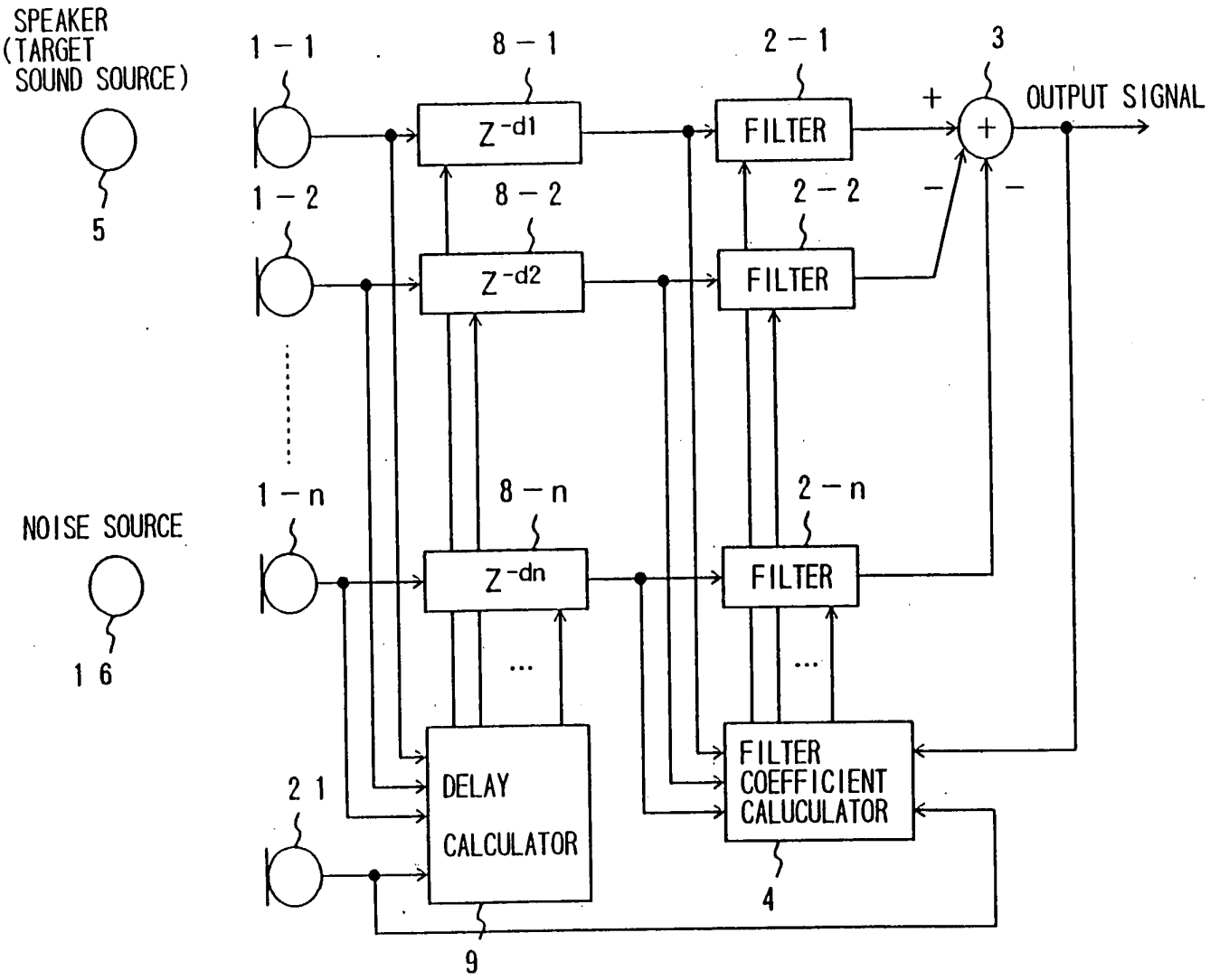

SPEAKER
(TARGET
SOUND SOURCE)
5
NOISE SOURCE
16
1-1
1-2
1-n
8-1
8-2
8-n
Z^{-d1}
Z^{-d2}
Z^{-dn}
2-1
2-2
2-n
FILTER
FILTER
FILTER
3
+
+
−
−
OUTPUT SIGNAL
21
DELAY
CALCULATOR
9
FILTER
COEFFICIENT
CALUCULATOR
4

FIG. 10

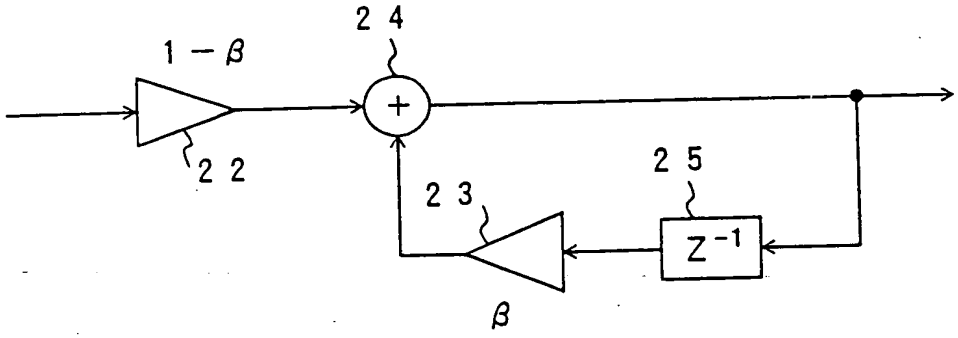

24
1 − β
+
22
25
23
Z⁻¹
β

FIG. 11

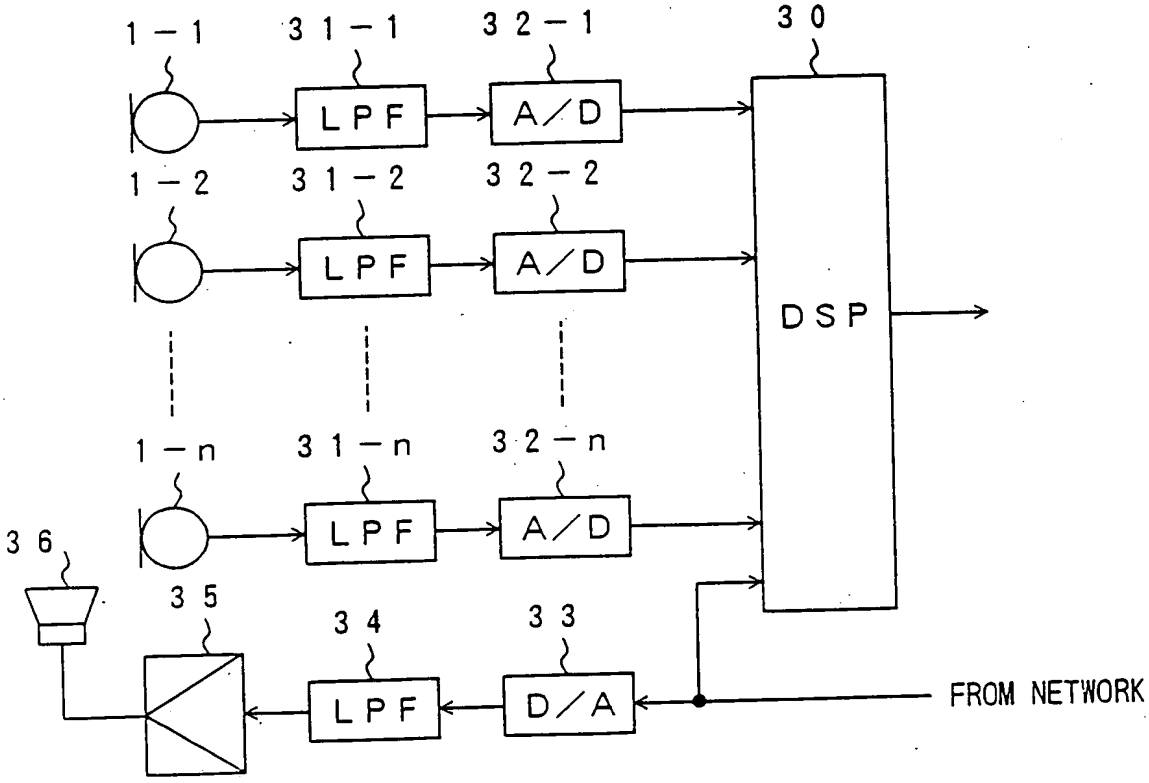

1 − 1
31 − 1
32 − 1
30
LPF
A/D
1 − 2
31 − 2
32 − 2
LPF
A/D
DSP
1 − n
31 − n
32 − n
LPF
A/D
36
35
34
33
LPF
D/A
FROM NETWORK

FIG. 12

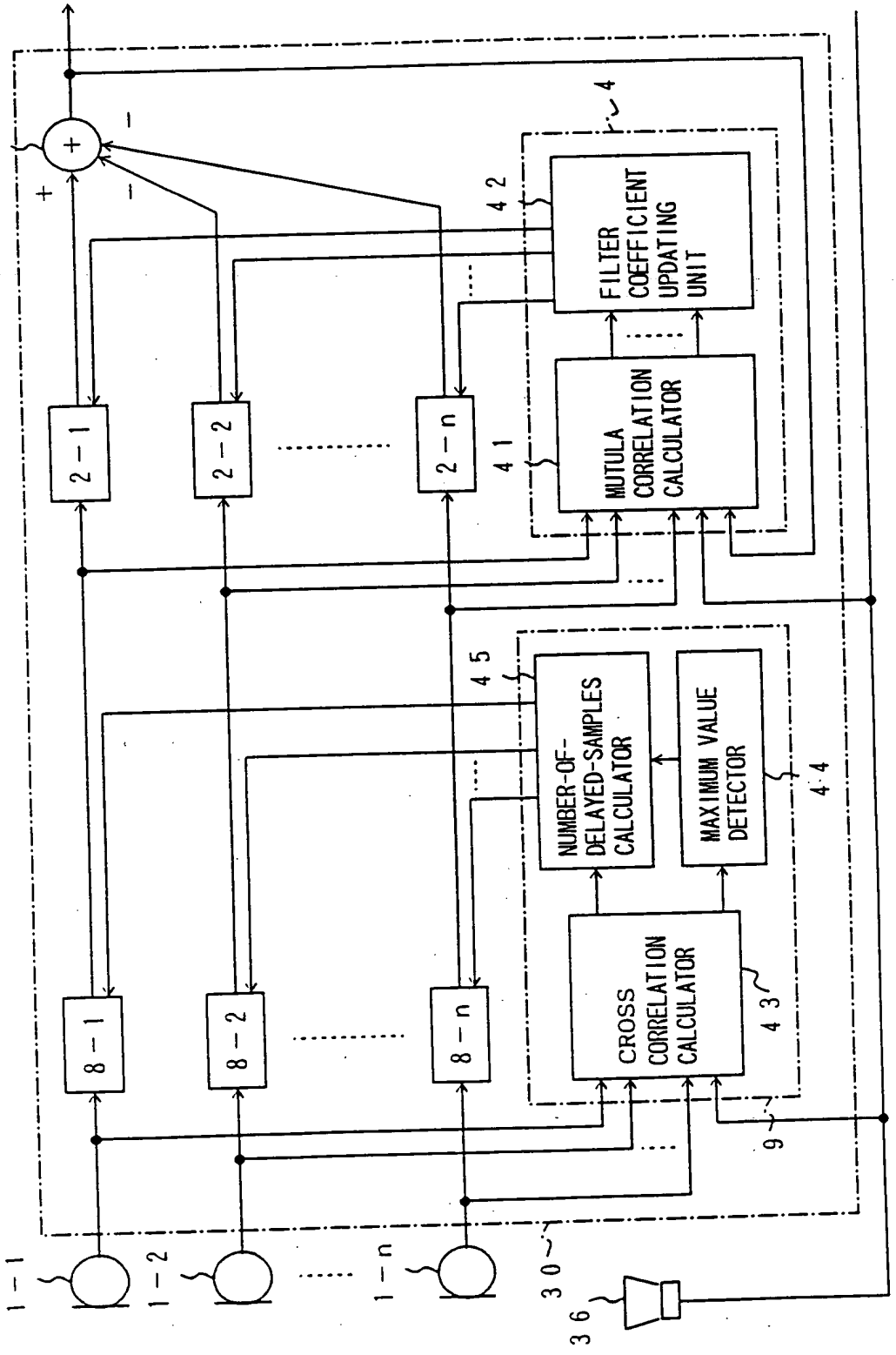

3
+
−
4
42
FILTER COEFFICIENT UPDATING UNIT
41
MUTUAL CORRELATION CALCULATOR
2−1
2−2
2−n
45
NUMBER-OF-DELAYED-SAMPLES CALCULATOR
MAXIMUM VALUE DETECTOR
44
43
CROSS CORRELATION CALCULATOR
8−1
8−2
8−n
9
1−1
1−2
1−n
30
36

FIG. 13

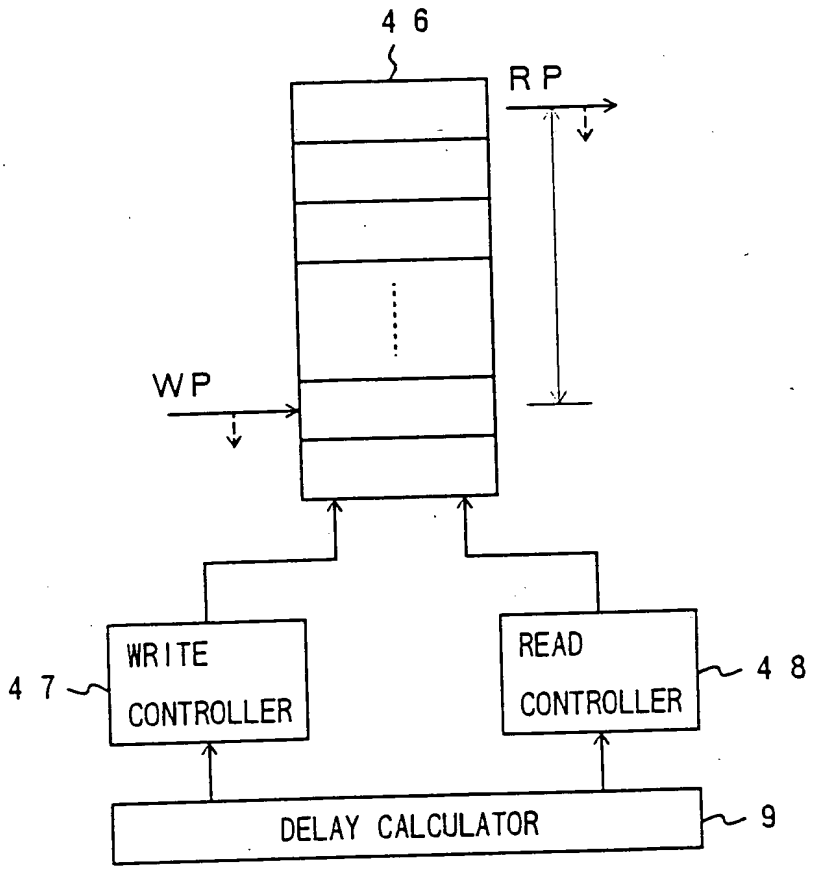

46
RP
WP
WRITE CONTROLLER
47
READ CONTROLLER
48
DELAY CALCULATOR
9

FIG. 14

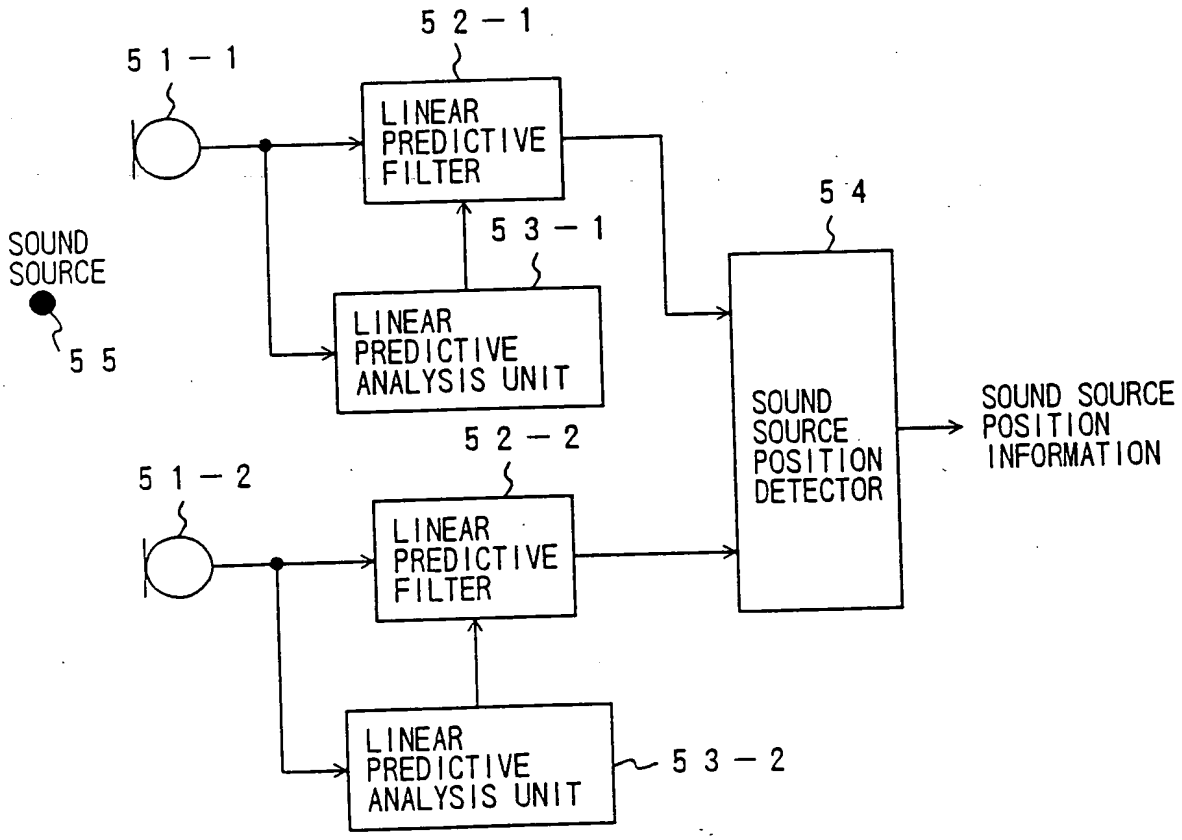

52-1
51-1
LINEAR PREDICTIVE FILTER
54
53-1
SOUND SOURCE
55
LINEAR PREDICTIVE ANALYSIS UNIT
SOUND SOURCE POSITION DETECTOR
SOUND SOURCE POSITION INFORMATION
52-2
51-2
LINEAR PREDICTIVE FILTER
LINEAR PREDICTIVE ANALYSIS UNIT
53-2

FIG. 15

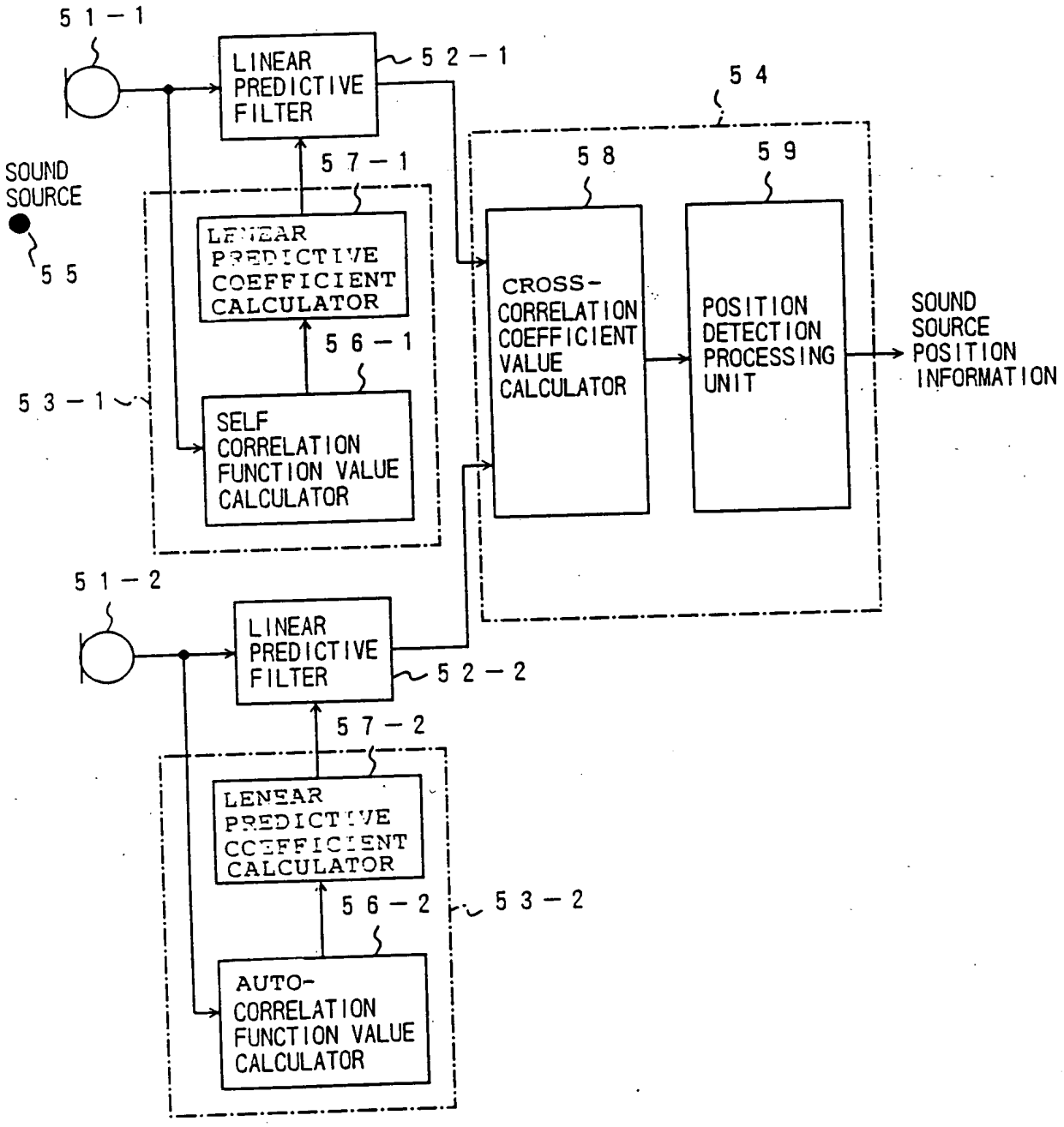

51-1
LINEAR PREDICTIVE FILTER
52-1
54
SOUND SOURCE
55
57-1
58
59
LINEAR PREDICTIVE COEFFICIENT CALCULATOR
56-1
CROSS-CORRELATION COEFFICIENT VALUE CALCULATOR
POSITION DETECTION PROCESSING UNIT
SOUND SOURCE POSITION INFORMATION
53-1
SELF CORRELATION FUNCTION VALUE CALCULATOR
51-2
LINEAR PREDICTIVE FILTER
52-2
57-2
LINEAR PREDICTIVE COEFFICIENT CALCULATOR
56-2
53-2
AUTO-CORRELATION FUNCTION VALUE CALCULATOR

FIG. 16

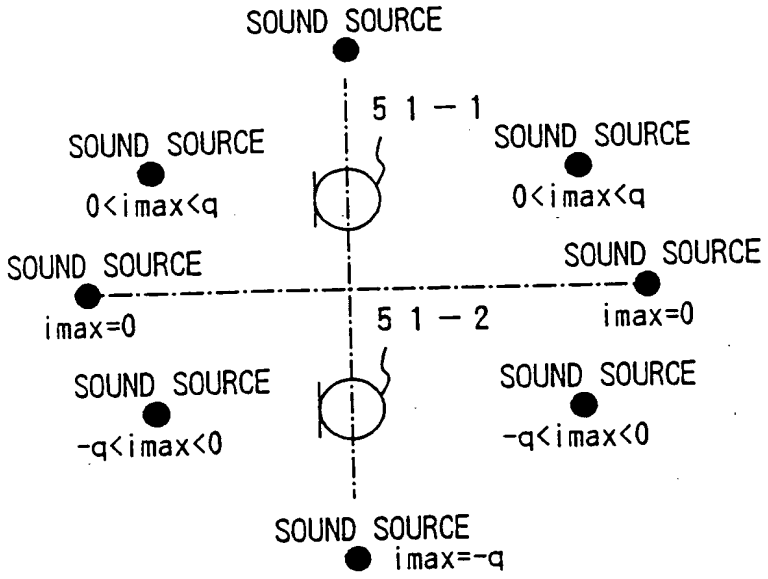

SOUND SOURCE
5 1 − 1
SOUND SOURCE
0<imax<q
SOUND SOURCE
0<imax<q
SOUND SOURCE
imax=0
SOUND SOURCE
imax=0
5 1 − 2
SOUND SOURCE
-q<imax<0
SOUND SOURCE
-q<imax<0
SOUND SOURCE
imax=-q

FIG. 17

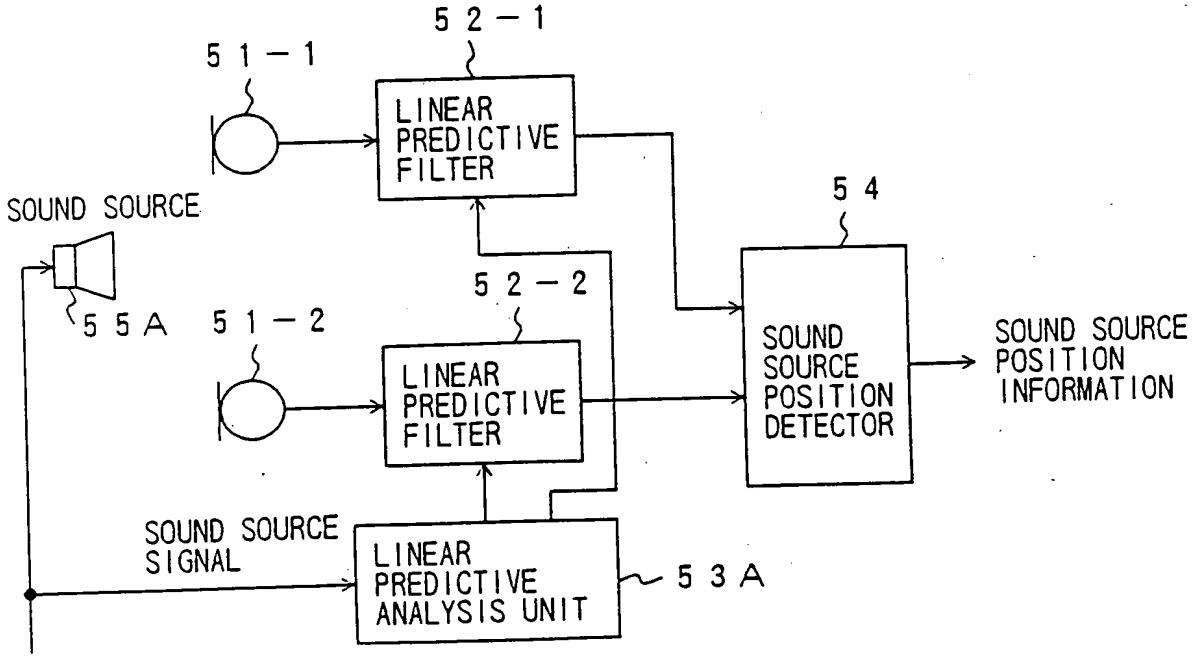

5 2 − 1
5 1 − 1
LINEAR PREDICTIVE FILTER
SOUND SOURCE
5 4
5 2 − 2
5 5 A
5 1 − 2
LINEAR PREDICTIVE FILTER
SOUND SOURCE POSITION DETECTOR
SOUND SOURCE POSITION INFORMATION
SOUND SOURCE SIGNAL
LINEAR PREDICTIVE ANALYSIS UNIT
5 3 A

FIG. 18

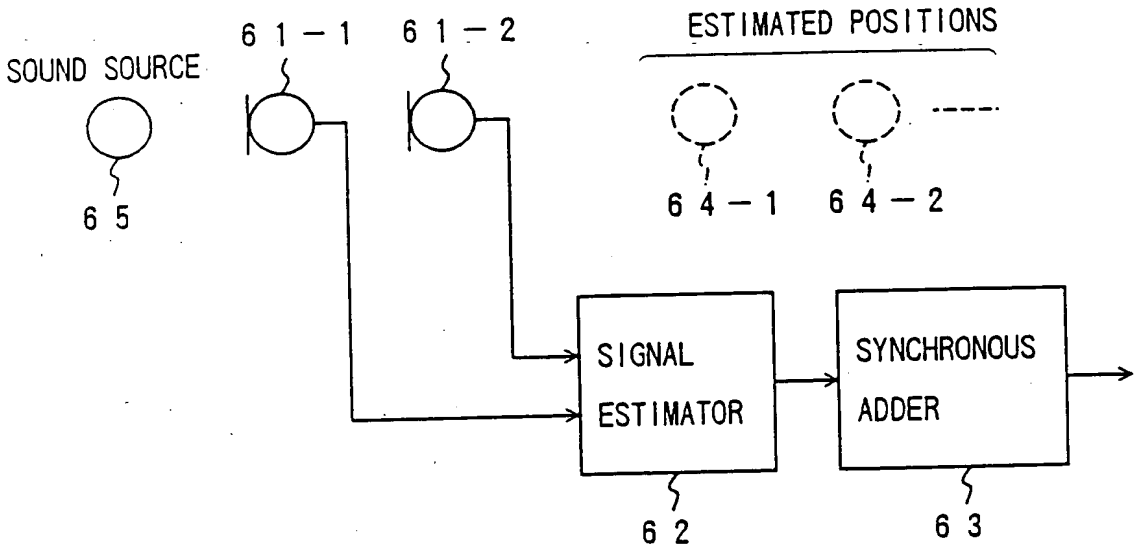

SOUND SOURCE
65
61-1
61-2
ESTIMATED POSITIONS
64-1
64-2
SIGNAL ESTIMATOR
62
SYNCHRONOUS ADDER
63

FIG. 19

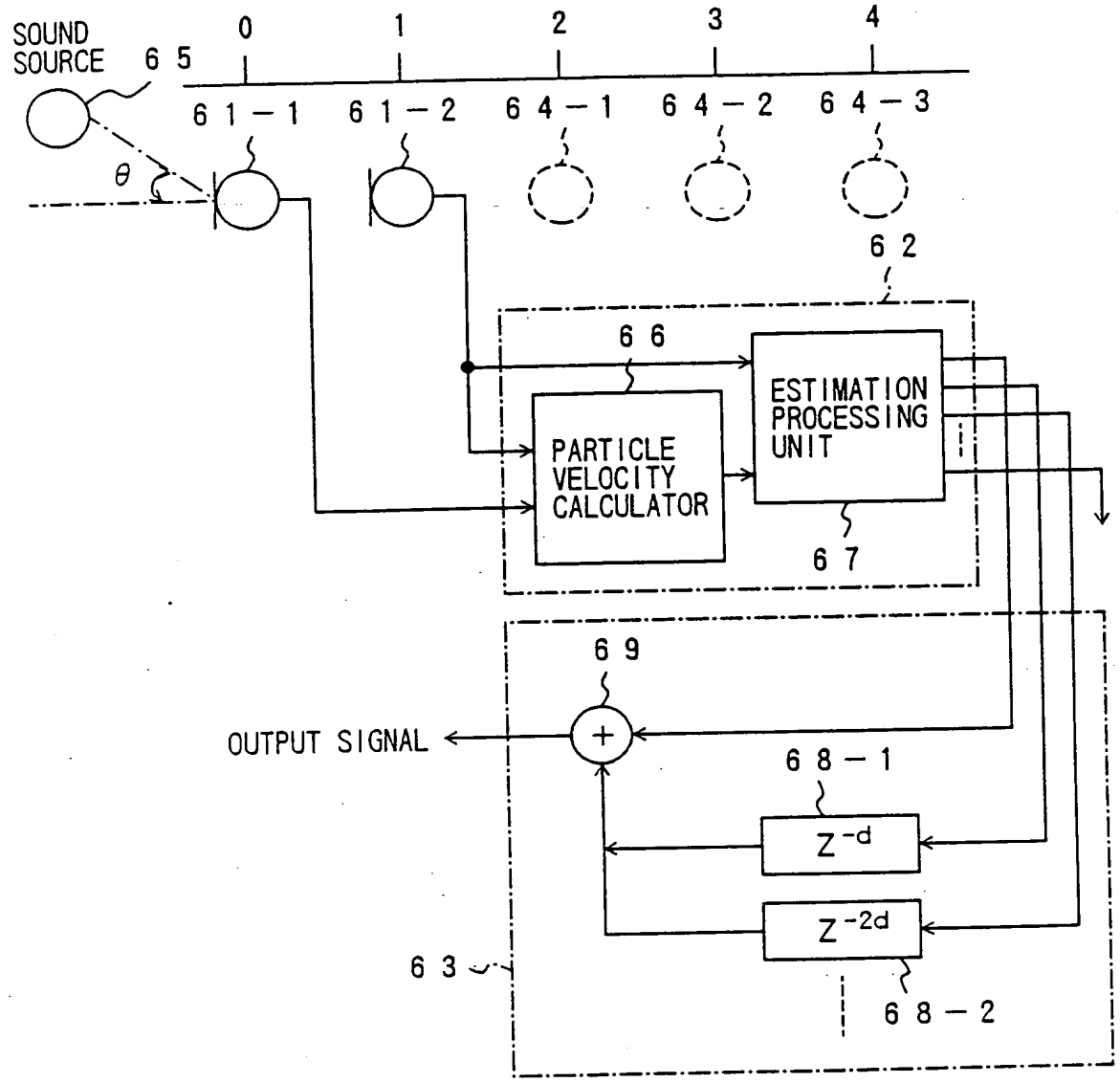

SOUND SOURCE
65
0
1
2
3
4
61-1
61-2
64-1
64-2
64-3
θ
62
66
ESTIMATION PROCESSING UNIT
PARTICLE VELOCITY CALCULATOR
67
69
OUTPUT SIGNAL
68-1
Z-d
Z-2d
63
68-2

FIG. 20

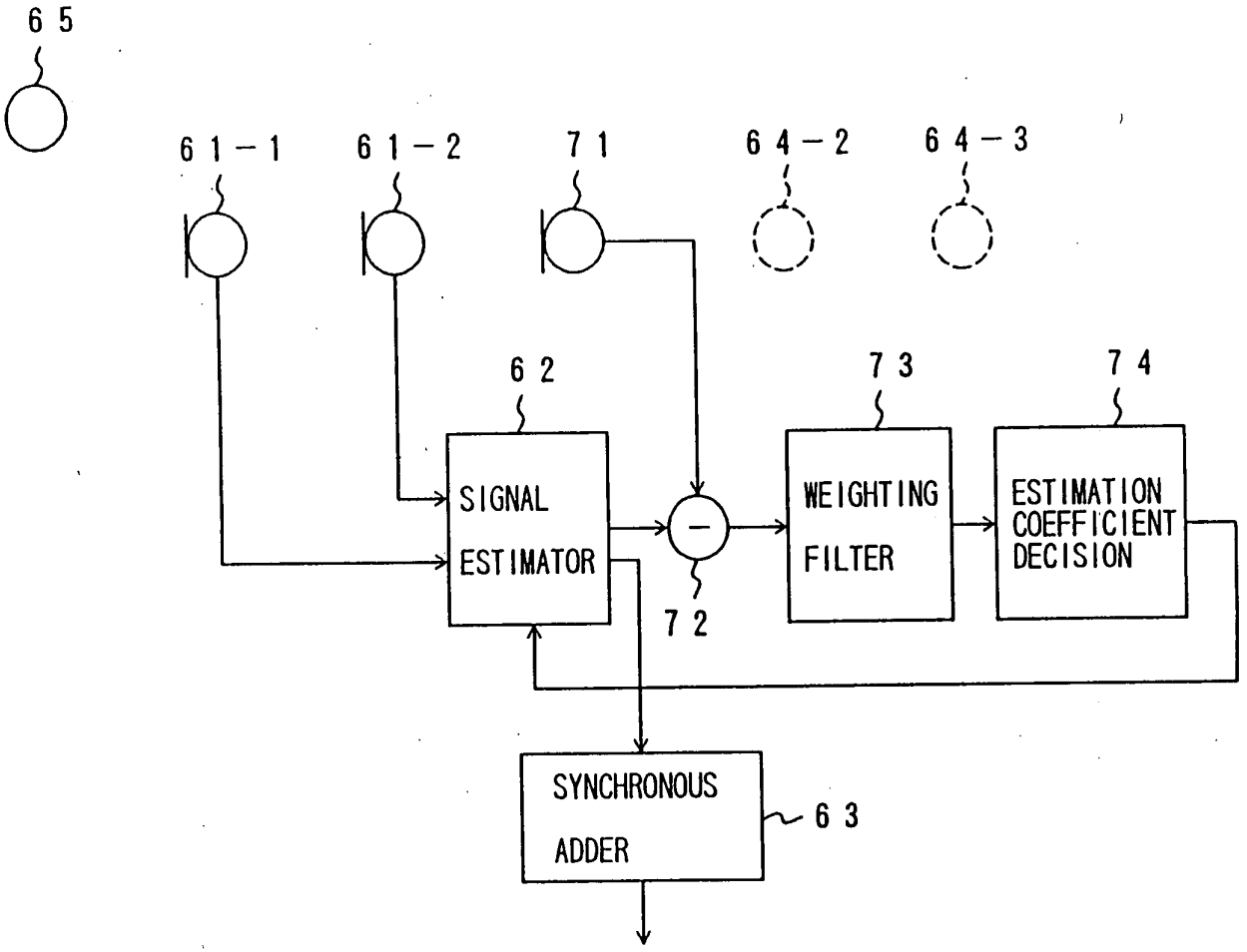

65
61-1
61-2
71
64-2
64-3
62
73
74
SIGNAL ESTIMATOR
72
WEIGHTING FILTER
ESTIMATION COEFFICIENT DECISION
SYNCHRONOUS ADDER
63

FIG. 21

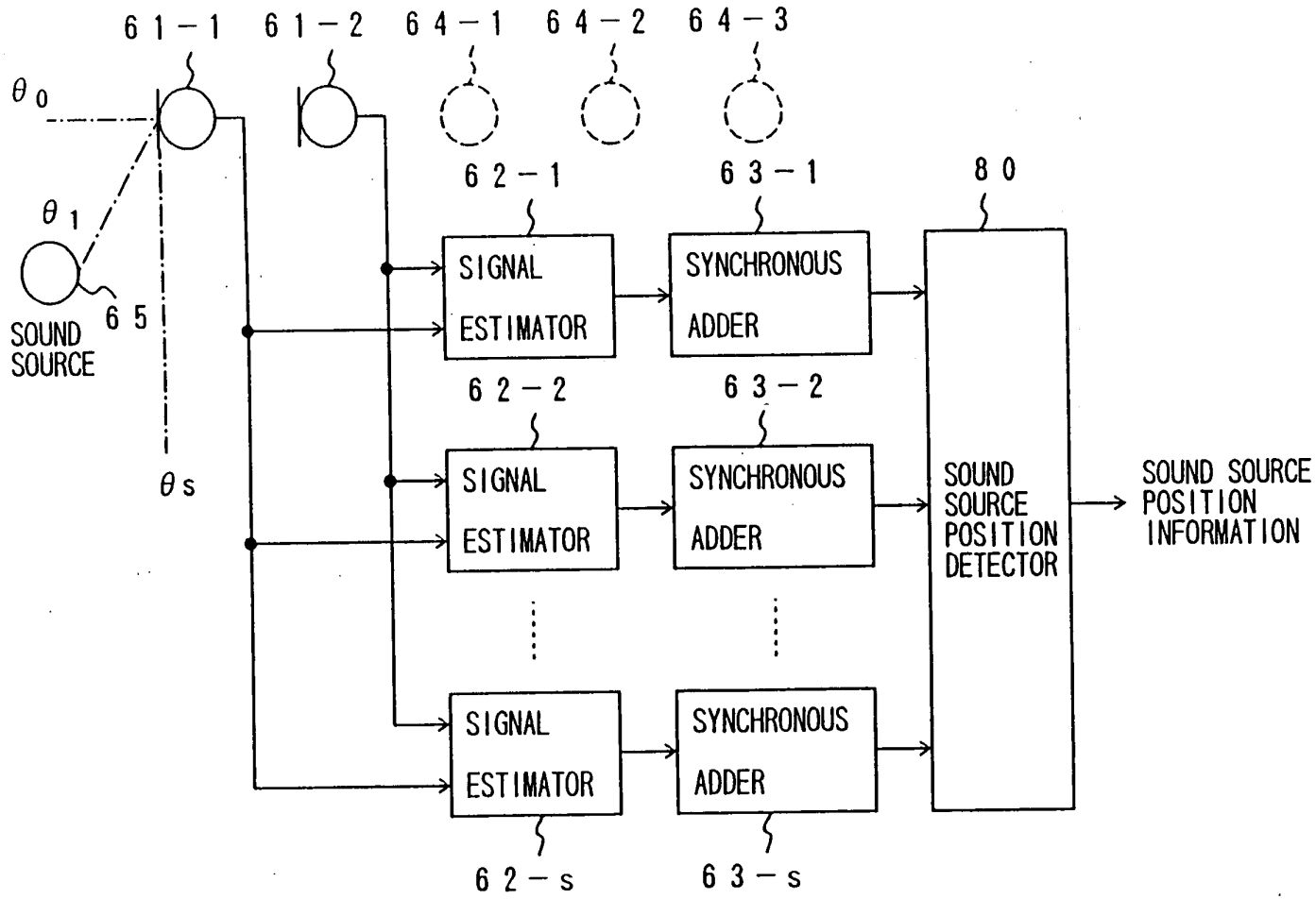
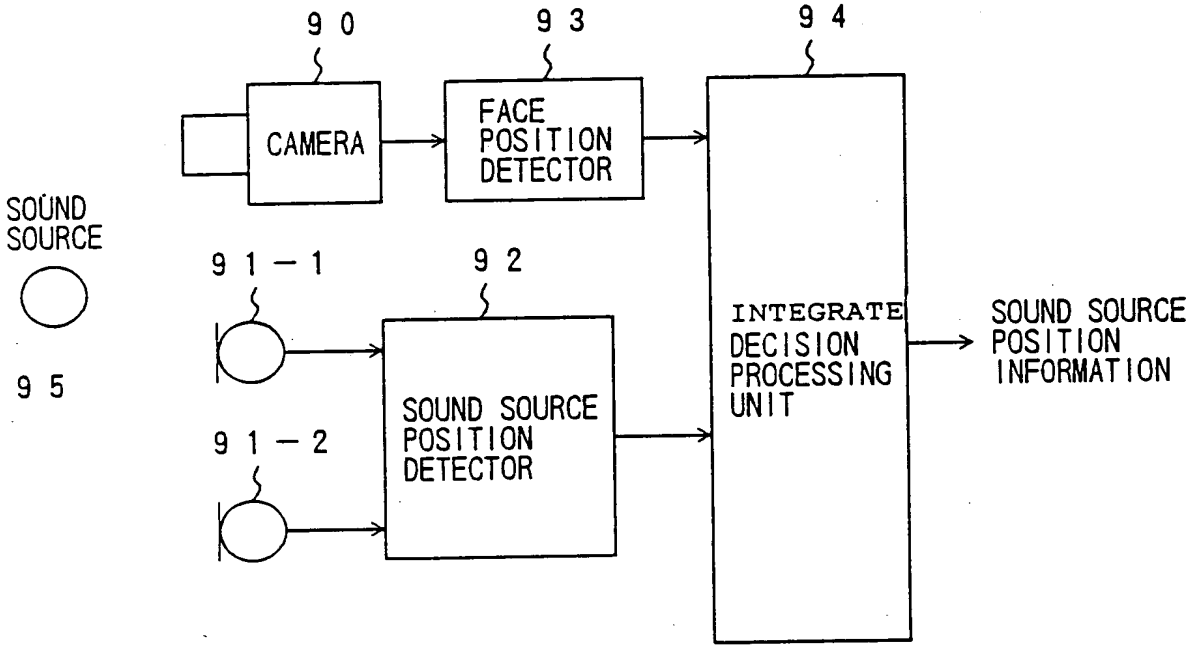

61-1
61-2
64-1
64-2
64-3
θ0
θ1
θs
65
SOUND SOURCE
62-1
63-1
80
SIGNAL ESTIMATOR
SYNCHRONOUS ADDER
62-2
63-2
SIGNAL ESTIMATOR
SYNCHRONOUS ADDER
SOUND SOURCE POSITION DETECTOR
SOUND SOURCE POSITION INFORMATION
SIGNAL ESTIMATOR
SYNCHRONOUS ADDER
62-s
63-s

FIG. 22


90
93
94
CAMERA
FACE POSITION DETECTOR
SOUND SOURCE
95
91-1
92
INTEGRATE DECISION PROCESSING UNIT
SOUND SOURCE POSITION INFORMATION
91-2
SOUND SOURCE POSITION DETECTOR